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Paganopoulos, Michailangelos; (2020) Opening the third space between laboratory research and public policy during the Covid-19 pandemic. In: ASA2020: How to Live Through a Pandemic, 27 August 2020, <https://nomadit.co.uk/conference/asa2020>. <https://www.nomadit.co.uk/conference/asa2020/paper...> (In Press)

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Opening the third space between laboratory research and public policy during the Covid-19 pandemic

Michelangelo Paganopoulos

Global Inquiries and Social Theory Research Group, Faculty of Social Sciences and Humanities, Ton Duc Thang University, Vietnam michelangelopaganopoulos@vdtu.edu.vn

Introduction

Between January to May 2020, as the pandemic of the “novel coronavirus”¹ was spreading across the continents, I had the opportunity to accessing the online repository with the latest ongoing research models and mapping projections of the Centre for Mathematical Modelling of Infectious Diseases of the London School of Hygiene and Tropical Medicine (CMMID).² LSHTM is one of the board members of the “scientific advisory group for emergencies” (SAGE) set up by the UK government in response to the pandemic, funded by the National Institute for Health Research - Health Protection, the Research Unit in Immunisation (MJ) and for Modelling Methodology (MJ, TJ, JE), the Economic and Social Research Council RCUK grant ES/P010873/1 (TJ), the UK Public Health Rapid Support Team (TJ), the Bill & Melinda Gates Foundation grant OPP1183986 (ESN) the Nakajima Foundation (AE), the Alan Turing Institute (AE) and the Wellcome Trust grant 210758/Z/18/Z (SA). Since the outbreak of Covid-19, the group offers its scientific advice on controlling the rhythm of distribution of Covid-19 (“R0 number”), isolating “increased risk” categories, implementing social distancing measures in public policy (“governmentality”), and assessing counter responses of the population to restrictive measures and exit strategies (i.e. “behavioural science”).

Following World Health Organization’s first public announcement on social media of a cluster of pneumonia cases in Wuhan, Hubei province, on January 4 2020,³ the amount of research updates and new papers I was processing for the School’s Open Access repository rapidly increased. My privileged insight in laboratory research from *below*, offered me a critical perspective into how infectious disease modelling is oriented, formulated, and used in public policy during and after the health crisis. This perspective allowed me to see how the gaps between laboratory research and

¹ “Coronaviruses (CoVs) constitute a large family of viruses found in nature. CoVs belongs to the family Coronaviridae and the order Nidovirales possessing a single-stranded, positive-sense RNA genome ranging from 26 to 32 kb in length (the largest genome of known RNA viruses) with G + C contents varying from 32 to 43%. Based on the genomic structure and phylogenetic analysis the subfamily Orthocoronavirinae consists of four genera namely Alphacoronavirus, Betacoronavirus, Gammacoronavirus and Deltacoronavirus. Among these, Alphacoronavirus and Betacoronavirus infects only mammals and are responsible for respiratory infection in humans and enteritis in animals. Two major zoonotic pathogenic coronaviruses, SARS-CoV and MERS-CoV belong to the genus Betacoronavirus.” (Malik *et al.* 2020: 68-76).

² CMMID research group is led by Professor Graham Medley focusing on the way mathematics are used to form social policy. The team cooperates with other institutions, such as the UK government advisor body NERVTAG (“New and Emerging Respiratory Threats Advisory Group”). CMMID Work Group consists of Arminder K Deol, Hamish Gibbs, Kathleen O'Reilly, Graham Medley, Joel Hellewell, Alicia Rosello, Billy J Quilty, Charlie Diamond, Petra Klepac, Amy Gimma, Rosalind M Eggo, Megan Auzenberg, Samuel Clifford, Gwen Knight, Sebastian Funk, Anna Foss, Fiona Sun, Jon C Emery, Kiesha Prem, Yang Liu, Kevin van Zandvoort, Christopher I Jarvis, James D Munday, Adam J Kucharski, Carl A B Pearson, Timothy W Russell, Nikos I Bosse, Stefan Flasche, Rein M G J Houben, Simon R Procter, Nicholas G. Davies. Updates on research on Covid-19 at LSHTM: <https://cmmid.github.io/topics/covid19/> [Accessed 1/5/2020].

³ See updates and timeline of all activities relating to Covid-19 of the World Health Organization at <https://www.who.int/news-room/detail/27-04-2020-who-timeline--covid-19>. [Accessed: 7/5/2020].

public policy reflect upon older methodological and ethical gaps between quantified and qualitative data evaluations. Furthermore, the rapid spreading rhythms of the pandemic made me wonder how would multi-sited ethnography (Marcus 1995) integrate with epidemiology in the post-Covid-19 future? Accordingly, which are the overlapping theoretical processes in the dialectics between **integration and enlargement** through which social epidemiology and medical anthropology are “integrated” (as in Trostle 2005, 4, and Dunn and Janes 1986/2012, 4) as they emerge, “in the meantime”, out of the crisis into a symbiosis formed by “emerging” circumstances and new biotechnologies (as in Fischer 2018)?

Methodological Problem I

Preliminary Estimates in Identifying “risk” categories

- *CMMID nCov Working Group*, Clark, Andrew; Jit, Mark *et al.* “How many are at increased risk of severe COVID-19 disease? Rapid global, regional and national estimates for 2020”. (April 14 2020). https://cmmid.github.io/topics/covid19/Global_risk_factors.html ; [Accessed: 1/5/2020].

In a newsletter published on April 17 2017, two prominent members of the CMMID team, Dr Andy Clark and Dr Rosalind Eggo, urgently called for “further work to quantify and analyse the associated risks”, specifically for those groups that represented “increased risk” because of other underlying conditions.⁴ Accordingly, they highlighted in their report that “higher risk” categories varies from individual to individual, as well as from country to country, depending to a number of variables that are both pathogenic and social. By prevalence comparing data taken from 188 countries according to age, sex, and residence using the Global Burden of Diseases, Injuries and Risk Factors list of 2017 (GBD) along with UN population estimates for 2020, the researchers estimated that one in five citizens may have underlying conditions, raising the importance of redefining and correctly identifying “high risk” categories, both individuals and specific locations, in mitigating the spreading of the disease. In order to draw a picture of the degrees of risk, the researchers used early data from China on age-specific ratios from infection to hospitalisation making necessary adjustments on the basis of the assumption that males are twice as likely “to be at high risk” than females. At this early stage of the pandemic, the authors admitted that they could not as yet consider social and other factors that may affect the degree of risk for individuals, such as deprivation, ethnicity, or obesity.

- *CMMID nCov Working Group*, Davies, Nicholas; Kucharski, Adam; Eggo, Rosalind *et al.* “The effect of non-pharmaceutical interventions on Covid-19 cases, deaths and demand for hospital services in the UK: a modelling study”. (April 1 2020 and updated on June 6 2020). <https://cmmid.github.io/topics/covid19/uk-scenario-modelling.html> [Accessed: 2/5/2020].

In an early effort to quantify such socio-cultural factors, CMMID published another overview focusing on non-pharmaceutical interventions by using age-structured transmission models that explored the possibilities of a variety of hypothetical scenarios and simulated a variety of duration periods and interventions (i.e. “stochastic” or “scenario modelling”). Hypothetical interventions varied from the worldwide introduction of social distancing, shielding risk groups and school closures, to biotechnological solutions -such as the introduction of thermal temperature checks and screening for travellers after the easing the lockdown and re-opening of airports all of which are

⁴ LSHTM Newsletter “One in five people globally could be at increased risk of severe COVID-19 disease through underlying health conditions (17 April 2020). <https://www.lshtm.ac.uk/newsevents/news/2020/one-five-people-globally-could-be-increased-risk-severe-covid-19-disease?fbclid=IwAR2WSN6bhxbbeUavrhctHLzVlbuVYcZmlOk0KZhfsdCxYi1gtwxo4XJU3WU> [Last Accessed 22/8/2020].

being negotiated on the basis of risk evaluations and risk factors.⁵ They concluded that “extreme measures” may be required to bring the epidemic under control and demand for hospital beds and intensive care units (ICU). Yet, the preliminary nature and lack of empirical data presented a huge gap in constructing mathematical models on the basis of probability rather than facts. These gaps became evident in yet another research by CMMID that was met with some controversy regarding its conclusion and close association with the government policy in the UK in March 2020.

- CMMID nCov Working Group, Hellewell, Joel *et al.* “Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts.” *The Lancet Glob Health* 8 (issue 4). (February 28 2020): E488-E496.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7097845/> DOI: [https://doi.org/10.1016/S2214-109X\(20\)30074](https://doi.org/10.1016/S2214-109X(20)30074) [Accessed: 22/8/2020].

The team developed a “stochastic” transmission model that worked on two models of short and long transmission periods between symptom onset and imposition of isolation.⁶ They took into account a number of variables associated with the reproduction number R_0 , including “the delay from symptom onset to isolation, the probability that contacts were traced, the proportion of transmission that occurred before symptom onset, and the proportion of subclinical infections.” The team worked on the assumption that isolation and contact tracing would decrease the number R_0 within 12 weeks and/or less than 5,000 cases in total controlling the reproduction of the virus. The team highlighted the probability of controlling the virus as directly dependent to a lower number R_0 (>1.5), and vice versa, higher R_0 would require higher number of contact tracing (2.5-3.5 would require 70% contact tracing of the population). Accordingly, the timing *between* effective contact tracing and isolation became vital in controlling the spread of the virus, as simulated outbreaks with long delays from symptom onset to isolation resulted to increased transmission before symptoms were shown (incubation period), which in turn would result to new cases that could eventually overwhelm the contact-tracing system. In addition to this, subclinical cases would further burden the system. The team concluded that “case isolation and contact tracing alone is insufficient to control outbreaks, and that in some scenarios even near perfect contact tracing will still be insufficient, and further interventions would be required to achieve control.”

However, a few months later in the same journal, Gurdasani and Ziauddeen heavily contested this conclusion.⁷ The two authors used as an example the strict government policies of South Korean and Singapore to argue that the late and relatively relaxed response of the UK government “was consistent with the conclusions of Hellewell and colleagues that these measures were unlikely to be

⁵ CMMID nCov Working Group, Quilty, Billy, Clifford, Sam *et al.* “Effectiveness of airport screening at detecting travellers infected with novel coronavirus (2019-nCoV).” (7 February 2020) <https://cmmid.github.io/topics/covid19/airport-screening.html>. See also interactive tool to assess four different scenarios, <https://cmmid.github.io/visualisations/traveller-screening> [Accessed 9/5/2020].

⁶ A similar model was used by another research focusing on the incubation period pre-symptomatic transmission published back in April 2020 focusing on the infection rate at Shenzhen, China. The team worked on two scenarios, a “no-active” and an “active” case scenarios that averaged six days of incubation period and expanded from 6 to 8 days after symptom onset. The team estimated that 23% of transmissions “may” have originated from pre-symptomatic infections. The percentage doubled through accelerated case isolation following symptom onset (46%), which meant that “about 35% of the secondary infections had been prevented due to restrictive measures. Despite the uncertainty of the data, the researchers insisted that the results were “robust” when compared to “incubation periods and serial intervals from other settings.” CMMID nCov Working Group, Liu, Young; Funk, Sebastian; and Flasche, Stefan. “The contribution of pre-symptomatic infection to the transmission dynamics of Covid-19.” (April 1 2020, updated July 6 2020). *Wellcome Open Res* 2020, 5:58 (<https://doi.org/10.12688/wellcomeopenres.15788.1>)

⁷ Gurdasani D, Ziauddeen H. On the fallibility of simulation models in informing pandemic responses. *Lancet Glob Health*. 2020;8(6):e776-e777. doi:10.1016/S2214-109X(20)30219-9.

able to bring the epidemic under control in under 12 weeks.” Although the two authors highlighted at the beginning of their critique of the UK’s decision to cease community testing and contact tracing on March 12 that their colleagues used a preliminary model that could not have processed empirical data due to the early stages of the pandemic, they also highlighted the flaws in modelling the median delays between 3.83 days (short) and 8.09 days (long): “Using the authors’ [original code](#), we demonstrate that when the delay is [changed to a median of 1 day](#), the model predicts the probability of controlling the epidemic within 12 weeks to be more than 80%, with 30–60% (ie, considerably less than near perfect) contact tracing (depending on the proportion of pre-symptomatic cases at a given time). These results suggest that rapid testing, contact tracing, and isolation could be effective strategies to control transmission.” Accordingly, the two authors were critical of over-reliance on stochastic models and highlighted the need to use empirical data from the field along mathematical models in order to avoid the same mistakes that can be proved both costly and entangled within political interests, which may in the end come in conflict with public health interest.

In response to Deepti Gurdasani and Hisham Ziauddeen’s criticism, Hellewell, Funk and Eggo⁸ highlighted that in the second part of their paper, they made it clear that “Rapid and effective contact tracing can reduce the initial number of cases, which would make the outbreak easier to control overall. Effective contact tracing and isolation could contribute to reducing the overall size of an outbreak or bringing it under control over a longer time period.” This conclusion does not abandon contact tracing but rather rapid testing and the use of other surveillance technologies may play a crucial role in mitigating the disease within the time limit of 12 weeks. They further clarified that the 3-4days delay between symptoms onset and hospitalisation was based on previous empirical data coming from Hong Kong during the late stages of the 2003 severe acute respiratory syndrome (SARS) outbreak. Yet, the controversy only shows gaps in how mathematical models are built, developed and used and their unfortunate deep entanglement with politics.

This early warning may carry huge ethical implications for the UK government considering the number of deaths in care homes that was subsequently revealed in the months following the lockdown on March 23 2020. In this opening section I wish to look at some of the research conducted by CMMID as it emerged during the spreading of the virus in the UK from February to May 2020, in order to understand how “risk” has been redefined in relation to bioethical, pathogenic, social, and cultural variables within the wider global context of the pandemic. Further research in behavioural science shows that the circular processing of data taken from the field into the laboratory (fieldwork) analysed and evaluated (research), and then returning them to the public as public policy (governmentality), has to be dialectically juxtaposed to a reverse feedback process in which communities and individuals respond to this policy (behavioural science).

For instance, Michie *et al.* (2020) published a paper focusing on how the population responded to Public Health England’s guidance prior to the implementation of social distancing measures. The team evaluated different behavioural responses according to the APEASE criteria, standing for Acceptability, Practicability, Effectiveness, Affordability, Spill-over effects, and Equity, within the Behaviour Change Wheel (BCW) framework. In addition, they limited response to three days. The authors assessed the UK government’s guidance on shielding published in March 2020 lacked specificity or motivation in persuading the public to engage in tailoring strategies that would affect the sense of collective self-responsibility. For this, the authors called for the involvement and collaboration of a number of grounded public sectors, from educational and eco-ethical institutions

⁸ Hellewell J, Funk S, Eggo RM. On the fallibility of simulation models in informing pandemic responses - Authors’ reply. *Lancet Glob Health*. 2020;8(6):e778-e779. doi:10.1016/S2214-109X(20)30217-5

towards wider environmental restructuring, community resourcing, and reducing equity. They further highlighted that the speed of the distribution of the outbreak calls for developing urgent mechanisms, which would spontaneously activate collaborations between various sites, academic disciplines, and policy makers, as a means to promptly respond to a future crisis.

Methodological Problem II

Estimating asymptomatic and subclinical cases

- *CMMID nCov Working Group*, Jit, Mark; Jombart, Thibaut; Nightingale, Emily; Endo, Akira; Abbott, Sam; and Edmunds, John. “Estimating number of cases and spread of Coronavirus disease 2019 (COVID-19) in the United Kingdom using critical care admissions, February to March 2020.” (April 7 2020). Doi: <https://doi.org/10.1101/2020.04.05.20054528> . [Accessed: 20/5/2020].

Following the lock down on 23 March 2020, a CMMID sub-team designed an exponential growth model on the basis of critical care admissions (CC) to UK hospitals in the period from February 16 up to the lockdown, in order to assert the impact of social distancing, by comparing the value of the reproduction number R_0 (average number of new cases transmitted per case in a susceptible population) before and after the measures were applied. In their report, the team highlighted the issue of unreported asymptomatic cases and underreported deaths, as well as, the dependence of the rate of infections to changing factors, such as the timing and quality of measures and/or intensity of a population.

The researchers estimated “age-dependent risk” by comparing their data to US and China, using the “First Few 100” Database (FF100) with cases taken from the early period of the outbreak, and data taken from the “COVID-19 Hospitalisations in England Surveillance System” (CHESS) set up by Public Health England to keep track of “all patients in ICU/HDU with influenza-like illness (ILI) and/or lower respiratory tract infections (LRTI) and/or pneumonia” who had tested for SARS-CoV-2.⁹ The team concluded that “hundreds of thousands of COVID-19 infections had occurred in the UK by the time the national lockdown of 23 March was implemented, with incidence doubling every 2.8 (95% CrI 2.5 – 3.0) days. This suggests that only around 1% of infections were being detected and reported [...] This provides evidence that strict physical distancing was necessary to prevent health services from being overwhelmed. However, across all scenarios the majority of the UK population remained uninfected, and hence timely interventions to reduce physical contact could have a large impact. Growth of the COVID-19 epidemic beyond 23 March depends on the effectiveness of these interventions.” The team informed estimates published by the “Scientific Pandemic Influenza Group on Modelling (SPI-M) which advises the Department for Health and Social Care in the UK.

- *CMMID nCov Working Group*, Russell, Timothy; Hellewell, Joel *et al.* “Using a delay-adjusted case fatality ratio to estimate under-reporting.” (30 April 2020). https://cmmid.github.io/topics/covid19/global_cfr_estimates.html. [Accessed 2/5/2020].

⁹ Public Health England. “Weekly Coronavirus Disease 2019 (COVID-19) Surveillance Report Summary of COVID-19 surveillance systems.” (Year: 2020 Week: 17) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/880925/COVID19_Epidemiological_Summary_w17.pdf [Accessed 20/5/2020].

Further comparative research focusing on death estimates revealed the dependence of accurate results in calculating the time between infection, symptom onset, and isolation. One of the CMMID research teams compared the estimates of case fatality ratio (CFR) in the UK in comparison to the rest of the world at the time of the research from January to March 2020. The comparison revealed that the numbers were inaccurately biased, because they could not include deaths and cases outside hospitals and/or consider the impact of time delays in reporting them in the first place. Other factors of “adjustment” include age and gender as discussed above. As with R_0 projections above, the researchers highlighted that processing the data may require further adjustments and corrections in trying to approximately quantify a number of undiagnosed cases.

- *CMMID nCov Working Group*, Nick Golding, Timothy W Russell, Sam Abbott, Joel Hellewell, Carl A B Pearson, Kevin van Zandvoort, Christopher I Jarvis, Hamish Gibbs, Yang Liu, Rosalind M Eggo, John W Edmunds, and Adam J Kucharski. “Reconstructing the global dynamics of under-ascertained COVID-19 cases and infections.” (July 8 2020). medRxiv 2020.07.07.20148460; doi: <https://doi.org/10.1101/2020.07.07.20148460>. [Accessed 22/8/2020].

A few months later, another CMMID Working Group made a second assessment regarding the wider global impact of underreported and/or asymptomatic subclinical infections from March to July 2020. The team used data from 210 countries that had more than 10 deaths, in order to estimate the level of ascertainment (“the ratio of confirmed symptomatic cases to the true number of symptomatic individuals”) and the temporal patterns of under-ascertainment using a Bayesian Gaussian model of probability. The team adjusted the published case fatality ratios (CFR) of each country to an estimated local delay-adjusted CFR, in order to understand the impact of time delays in reporting mildly symptomatic cases and draw a pattern of under-ascertainment. The team concluded that up to July 6, “Reported case counts will therefore likely underestimate the rate of outbreak growth initially and underestimate the decline in the later stages of an epidemic. Although there was considerable under-reporting in many locations, our estimates were consistent with emerging serological data, suggesting that the proportion of each country's population infected with SARS-CoV-2 worldwide is generally low.”

Asymptomatic and subclinical cases still present a major methodological problem in planning exit strategies and understanding the rate of the spreading of the disease. Furthermore, the two reports in particular that were published back in April 2020, did not seem to favour the delays in the UK government policy up to March 2020, but rather, exposed a deep gap between the laboratory and government policy with dangerous consequences for public health. A methodological issue therefore is understanding the impact of time delays in processing data from the laboratory to public health policy. A number of researches outside LSHTM highlighted further this distortion of data, which can have a direct impact on exit strategies, and a pragmatic distribution of hospital time and space (beds), equipment (ventilators) and PPE during this or future pandemics (Leon *et al.* 2020).

- *CMMID nCov Working Group*, Davies, Nicholas, Klepac, Petra *et al.* Update on “Age Dependent effects in the transmission and control of COVID-19 epidemics.” (30 April 2020). https://cmmid.github.io/topics/covid19/age_hypotheses.html [Accessed 1/5/2020].

In another ongoing research conducted by CMMID nCov working group, the team examined the hypothesis that children are less susceptible to infection and/or lower propensity to show symptoms. The researchers used an age-structured mathematical model with data taken from six countries to estimate and compare clinical symptoms and susceptibility to infection of pupils. The research highlighted that although the “working from home” scheme may be possible in higher income countries with easy access to the internet and alternative ways of working or social support, the economic reality of the majority of working families is very different in low income countries or

deprived areas. The team concluded that that “effective control measures” are necessary to be kept going to protect older populations, as well as younger ones living in low-income countries.

Nevertheless, the working reality undermined the need to retain the lockdown until positive results were actually shown. As research on vulnerable working groups shows, such as cleaners working in environments that can cause asthma, the economic need to continue working undermines the bioethical obligation to protect them (Brooks *et al.* 2020, 567-576). This raises ethical questions regarding the focus of research (schooling or labour) which carry hidden conflicts of interest that need to be directly addressed in order to form an adequate policy that protects the rights of both parents and children.

Methodological Problem III

Tracking Behaviour and Tracing Contacts

- *CMMID nCov Working Group and Saw Swee Hock School of Public Health, National University of Singapore, Singapore, Prem, Kiesha; van Zandvoort, Kevin, Klepac, Petra, Eggo, Rosalind; Davies, Nicholas, et al.* “Projecting contact matrices in 177 geographical regions: an update and comparison with empirical data for the COVID-19 era.” (July 28 2020). medRxiv preprint doi: <https://doi.org/10.1101/2020.07.22.20159772> [Last Accessed 23/8/2020].

The lack of empirical data in the preliminary stages of the distribution of the virus, as it was highlighted both by the critique of the CMMID approach by Gurdasani and Ziauddeen, as well as, the difficulty of quantifying the impact of the incubation period and asymptomatic cases, had a direct impact on the effort to track behaviour and trace contacts. Following the “social bubbles” solution advanced by the UK government, the CMMID team returned to the concept of “contact matrices”, referring to empirical data based on diary records “on who interacts with whom” in mixing matrices based on age-structured groups. However, due to the lack of such data worldwide, the team mathematically incorporated the estimating concept of “synthetic matrices”, i.e. “using more widely available setting-specific survey data on household, school, classroom, and workplace composition combined with empirical data on contact patterns in Europe” as they were first used back in 2017 (POLYMOD contact study in eight European countries). The team compared data collected in 2017 to estimated data in 2017 for non-European countries gathered both in 2017 and 2020 in 177 locations, in order to quantify contact patterns in both urban and rural settings. They argued that the comparison of empirical with synthetic data showed minimal differences between the two, meaning “that synthetic contact matrices may be used in modelling outbreaks in settings for which empirical studies have yet to be conducted.”¹⁰

- *CMMID nCov Working Group, Jarvis, Christopher; Van Zandvoort, Kevin et al.* “Quantifying the impact of physical distance measures on the transmission of COVID-19 in the UK.” (April 8 2020). In *BMC Medicine* 18 (May 7 2020). Doi: [10.1186/s12916-020-01597-8](https://doi.org/10.1186/s12916-020-01597-8) [Accessed 19/5/2020].

¹⁰ “Both synthetic and empirical matrices have complementary strengths and limitations. Empirical contact patterns are dependent on the study design and study population, and when the survey is administered. The synthetic contact matrices are constructed using proxies of contacts such as population and household age structures and country characteristics. However, the datasets used to develop these proxy measures (notably population age structure and DHS data) are generally much larger and more nationally representative than most empirical contact studies. To assess the robustness or consistency of the results under different mixing patterns, modellers should consider using multiple contact matrices constructed using different methods for sensitivity analyses.” <https://doi.org/10.1101/2020.07.22.20159772> [Last Accessed 23/8/2020].

- *CMMID nCov Working Group*, Jarvis, Christopher; Van Zandvoort, Kevin *et al.* Update on “Impact of physical distance measures on transmission in the UK.” (April 20 2020). <https://cmmid.github.io/topics/covid19/comix-impact-of-physical-distance-measures-on-transmission-in-the-UK.html> [Accessed 19/5/2020].

Another CMMID team, headed by Jarvis and Van Zandvoort, mathematically quantified the impact of the measures taken in the UK on Monday March 23 2020 by sending a questionnaire to a “representative sample of UK adults”, in which they asked them to trace their moves and contacts on the day the lockdown was implemented. The team then compared this data to previous surveys on social contact under “normal” circumstances. By comparing measured contact patterns before and after the measures were implemented, the team was able to make a first assessment regarding the impact of physical distancing on the distribution rate of the virus. The researchers highlighted questionable delays in seeing results following the implementation and degrees of measures, as the projected decline of transmission did not occur when expected. For this reason, the team suggested that, “Tracking behavioural change can give a more rapid assessment of the impact of physical distancing measures than routine epidemiological surveillance.” In the update made by the same team, the ongoing monitoring of human behaviour finally started to show positive results, as social distancing and close-contact reduction up to 70% dramatically decreased the value of R_0 below 1. For this reason, as in the researches cited above, the team highlighted the importance of prompt timing of the implementation of restrictive measures in order to be able to see accurate results in the right time, considering that the “projected decline in incidence will not occur immediately due to significant delays between infection, onset symptomatic disease and hospitalisation, and reporting these events.”

- *CMMID nCov Working Group*, Firth, J.A., Hellewell, J., Klepac, P. *et al.* “Using a real-world network to model localized COVID-19 control strategies.” (August 7 2020). *Nature Medicine* (2020). <https://doi.org/10.1038/s41591-020-1036-8>

In dealing with real-world empirical data and situations in respect to tracking and tracing contacts, CMMID used empirical data from a publicly available database on human social interactions originally collected for a BBC documentary focusing on residents of the town of Haslemere. The idea was to see the effectiveness of contact-tracing by investigating “social systems” of individual behaviour and contacts. The team argued that such systems are simply estimated on assumptions of how many contacts an individual may have over a specific period of time and through specific social networks (for example, at work, in school and so on). But they argued that in real life empirical data shows the variables for individual cases show “how different types of real-world social behaviour and hidden structures in real-life networks could affect both patterns of disease transmission and the efficacy of contact tracing under different scenarios.” In order to break through such assumptions the team therefore developed a “dynamic” mathematical model that took in account both the impact of contagion dynamics and control strategies by simulating these strategies “on a day-by-day basis as at least one daily 5-min period in which the distance between the individuals was within 4m (Methods), which gave 1,616 daily contact events and 1,257 unique social links among 468 individuals.” The repetition of these data created patterns of behaviour within specific social networks, both known and hidden. They then examined the data on simulated models that showed the peak of such contacts to be usually on the first three weeks of an outbreak, while simulated interventions and restrictions reduced the growth of the outbreak. On this basis, they argued that mass testing as a means of reducing the number of individuals in quarantine would be undermined by a high percentage of contact and decrease the effectiveness of contact tracing. Furthermore, they highlighted ethical issues, such as privacy, in implementing surveillance and restrictive measure on individual behaviours, as well as, the impact of children of less than 13 years old and their impact in spreading the virus.

In sum, the research promoted the use of “local lockdowns” when necessary (a policy that has been adopted by the UK government) in order to find a balance between tracing and quarantining contacts of contacts, which would require a large number of individuals to be quarantined, and

disruptions caused by massive lockdowns. A second point is the increasing use of digital technologies in tracking and tracing contacts on a daily and/or weekly basis, a point that has been made in a number of papers focusing on “population surveillance, case identification, contact tracing and evaluation of interventions on the basis of mobility data and communication with the public.”¹¹ The CMMID team in China,¹² as well as, UK the Medical Research Council–Uganda Virus Research Institute and London School of Hygiene and Tropical Medicine Uganda Research Unit in Uganda,¹³ conducted their own respective researches on the impact of travelling of tourists, workers and traders between countries, and effect of travelling restrictions for tracking any further transmission of the virus.

Inevitably, the increasing incorporation of digital and biotechnological surveillance technologies, some of which are home monitoring technologies, has raised ethical issues regarding privacy, as well as, matters of safety and security,¹⁴ -which have already been addressed by other papers in this conference. These ethical matters will need to be equally addressed within the grey areas of the integration of anthropological involvement in the field -as my discussion over the Ebola crisis in West Africa between 2013 to 2016 will show below.

Making adjustments and corrections

In a recent overview on “Prediction models for diagnosis and prognosis of covid-19 infection: systematic review and critical appraisal”, Wynants *et al.* (2020, 369, m1328) evaluated 27 studies and 31 prediction models of pneumonia and other proxies related to Covid-19, using CHARMs (critical appraisal and data extraction for systematic reviews of prediction modelling studies). The team then assessed the risk of bias of the results using the PROBAST risk of bias assessment software. According to the authors, the most common factors to determine the risk category of a patient with mild infection was age, body temperature, and symptoms. For more severe conditions, the research depend on further results deriving from tomography scans, C reactive protein, dehydrogenase, and lymphocyte count. The authors highlighted two methodological issues via comparison: first, they rated the majority of takings with a high rate of high-risk bias, in which the high-risk model “overfits” the target of the research and its results. Second, the qualitative aspect and methods used between researchers lacked of a concrete method of drawing or evaluating “risk categories”. In this respect, they assessed that the majority of models blindly fell into “overoptimistic” predictions. In combatting this distortion of results, the authors highlighted the urgent need to develop new models of prediction, such as the TRIPOD model (transparent reporting of multivariable prediction model for individual prognosis or diagnosis).

¹¹ Budd, J., Miller, B.S., Manning, E.M. *et al.* Digital technologies in the public-health response to COVID-19. *Nat Med* **26**, 1183–1192 (2020). <https://doi.org/10.1038/s41591-020-1011-4> [Last Accessed 20/8/2020].

¹² CMMID COVID-19 working group, Quilty, B.J., Diamond, C., Liu, Y. *et al.* “The effect of travel restrictions on the geographical spread of COVID-19 between large cities in China: a modelling study.” *BMC Med* **18**, 259 (2020). <https://doi.org/10.1186/s12916-020-01712-9>

¹³ Lule Bugembe D, Kayiwa J, Phan MVT, Tushabe P, Balinandi S, Dhaala B, *et al.* “Main routes of entry and genomic diversity of SARS-CoV-2, Uganda.” *Emerging Infectious Diseases* (October 2020) [early release July 2 2020]. <https://doi.org/10.3201/eid2610.202575> [Last Accesses 20/8/2020].

¹⁴ Gerke, S., Shachar, C., Chai, P.R. *et al.* “Regulatory, safety, and privacy concerns of home monitoring.” technologies during COVID-19. *Nat Med* **26**, 1176–1182 (2020). <https://doi.org/10.1038/s41591-020-0994-1> [Last Accessed 20/8/2020].

These methodological issues highlight the need for developing new tools for identifying and processing “risk” categories while incorporating a number of sociobiological and cultural hypothesis to be considered, for example, the association of certain ethnicities (BAME), their work environments and living conditions, with more severe cases of the disease. For instance, a new digital tool used by the “OpenSAFELY Collaborative” team at LSHTM is the online *OpenSAFELY* platform, which analyses NHS records of hospitalised patients. The tool maps risk associated patterns, which in turn, unearth the impact of underlying conditions and other factors on Covid-19 deaths.¹⁵ The Collaborative converted the Cox Proportional-Hazards 1976 model (*Cox Regression*) which measures the impact of several variables on a specific place and time. They converted the data on *OpenSAFELY*, in order to make further “adjustments” in terms of age and gender and generate hazard ratios according to other covariables. The results highlighted the increased risk posed to male “Asian and black groups” because of pre-existing clinical risk factors and/or deprivation. This is an ongoing project, daily updated with more patient records.

Another evaluating tool used for “adjusting” data is the STRATOS “guidance” for measurement-error and classification of variables of biostatistical data. Keoh *et al.* (2020) in their overview over “uncertainties” in estimations using the Calibration model for linear models and variable selection methodology for nonlinear prediction models, offered a review of different types of measurement - errors and misclassifications (including the “Berskon error”, “classical error”, “differential” and “nondifferential errors”, sample size, etc.). The authors looked into adjusting measurement-errors in terms of regression calibration (RC) and simulation extrapolation (SIMEX), such as the Bayesian method, multiple imputation to explore patterns of missing data, and the likelihood-based approach, all of which could contribute in adjusting and/or filling in missing data. These include the “risk set regression calibration” approach, which researchers in China developed into a risk set approach that includes time dependent covariates (Keoh *et al.* 2020, 27). SIMEX, on the other hand, is particularly useful in personalizing statistical data focusing on the individual health condition (for example heart rate) in relation to longitudinal data from previous observations. The authors called for further processing of data by pointing that, “even when such quantitative information is available, the adjusted analyses are not being performed (*Ibid.*, 31).

Redefining the “Social” and “Cultural” as Risk Categories

The implementation of mathematical models to public policy according to “increased risk” and “increased factors” is still a complicated matter that cannot be limited to understanding the disease in a laboratory but extends to social and economic life. In a recent article in *The Lancet Public Health*, Ahmed *et al.* highlighted “the inadequate financial protections for low wage workers” (2020, e40), which increases the “increased risk” factor for the individual well-being -beyond laboratory research. As Susser and Stein elsewhere noted: “Yet even in a series of affected cases the study of individuals alone cannot ordinarily determine the limits of the disorder in relation to normality, nor can it securely predict its onset, progress, and outcome.” (2009, 10). Research shows that various external factors, such as crowded living conditions, poverty, bad sanitation and deprivation, should be

¹⁵ Science Media Centre. “The Open SAFELY platform”. (May 7 2020) <https://www.sciencemediacentre.org/the-opensafely-platform-using-electronic-health-records-to-identify-factors-associated-with-covid-19-hospital-death/> [Accesses 20/5/2020]. The OpenSAFELY Collaborative; Williamson, Elizabeth; Walker, Alex; Bhaskaran, Krishnan; Bacon, Seb; Bates, Chris *et al.* “OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients.” In *BMJ Yale* (May 7 2020). <https://www.medrxiv.org/content/10.1101/2020.05.06.20092999v1> [Accessed 20/5/2020].

evaluated as “increased risk”.¹⁶ Nick Stripe, the Head of Health Analysis of the UK Office of National Statistics concluded in a recent report that, “People living in more deprived areas have experienced COVID-19 mortality rates more than double those living in less deprived areas. General mortality rates are normally higher in more deprived areas, but so far COVID-19 appears to be taking them higher still.” Nevertheless, the implementation of mathematical models to public policy according to “increased risk” and “increased factors” is still a complicated matter that cannot be limited to understanding the disease in a laboratory but extends to social and economic life. In a recent article in *The Lancet Public Health*, Ahmed *et al.* highlighted “the inadequate financial protections for low wage workers” (2020, e40), which increases the “increased risk” factor for the individual well-being - beyond laboratory research.

It is important to highlight here that the well-being of one individual is directly connected and depended to the well-being of the community, and vice versa, the health of the community depends to each one of its members. From this perspective, identifying “risk” categories requires an integrated qualitative and quantitative evaluation of laboratory data, in order to avoid distorting the individual circumstances of each patient through a sterile process of homogenizing and quantifying data. In addition to methodological and ethical issues, further cultural widely varied criteria may complicate *the degree of risk* posed by and to individuals. Trostle (2005) has highlighted that cultural and other idiosyncratic ambiguities in particular may undermine the effort to scientifically (“universally”) identify “risk factors”. On the other hand, Covid-19 had a devastating impact to “increased risks” groups, such as those living in care homes in the UK. The protection of “risk” categories is therefore integral in care home and protecting health services and availability of beds in ICU during this or a future pandemic.

Arguably then, tensions between the laboratory and public policy expose methodological gaps in the process of *integration* between epidemiology and perceptions of “risk”, quantitative and qualitative methodology, epidemiological and cultural studies, objectivity and subjectivity, respectively. These grey areas may affect in a negative way the process of unpacking cultural, geographic, and chronological variables, leading to quantitative reductionism and a tendency to homogenize fieldwork data, which results to the distortion of each discipline’s “field”. As Trostle has argued from the dynamic perspective of cultural heterogeneity and change, a comparison reveals the “distinctions in our seemingly universal view of health and disease.” (*Ibid.*). For this reason, a comparative collaborative approach may be needed to develop in collaboration between laboratories, social scientists, government bodies, and the population, in order to accurately understand the overlapping biological and the social aspects of the virus in response to the outbreak.

A final point regarding the importance of identifying “risk” categories is in planning exit strategies for “returning” to a working normality. As I will discuss below in relation to the “African” case, strategic models for exit strategies are still on a preliminary level emerging in response to and out of the crisis.

¹⁶ Office for National Statistics. “Deaths involving COVID-19 by local area and socioeconomic deprivation: deaths occurring between 1 March and 1 April 2020.” (1 May 2020). <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsinvolvingcovid19bylocalareasanddeprivation/latest> . [Accessed 4 May 2020].

Methodological Problem IV

Collaboration in the Field - Learning from past experiences

- CMMID nCov Working Group, Jarvis, Christopher, Van Zandvoort, Kevin *et al.* "Response strategies for COVID-19 epidemics in African settings: a mathematical modelling study." (24 April 2020). <https://cmmid.github.io/topics/covid19/covid-response-strategies-africa.html>. [Accessed 3/5/2020].

The research team, led by Kevin Zandvoort and Christopher Jarvis, cross-examined data from three neighbouring countries (Nigeria, Niger, and Mauritius), in order to expose biased assumptions in non-pharmaceutical interventions. *The team* used mathematical models to measure susceptible, exposed, infectious, and recovered patients, according to their age and social mixing patterns. They then compared the mortality rates to excess deaths in order to evaluate their respective intervention strategies according to three aged groups (infants, middle aged, elderly). They concluded that both self-isolation and moderate shielding could dramatically contribute to the mitigation of the pandemic and protection of risk groups. A further research suggested the creation of "green zone" areas (similar to a war zone) where "high risk" individuals can be safely isolated for extended periods and necessary expansion of existing health service capacities. In addition, the research showed that temporary lockdowns were crucial in gaining time for planning, *but only where they can be socioeconomically acceptable by the local population*. Accordingly, a member of the team pointed that, "Shielding should reduce transmission within the high-risk groups that may account for most hospitalisation and mortality. *However, these arrangements must be community-led, rather than coercive. Humanitarian and development actors have a role to play to support such coping strategies*" (Francesco Checchi, *my emphasis*).¹⁷ By this, Checchi specifically referred to long term issues, including "insufficient water and sanitation, and overcrowded cities, the health and economic toll of coronavirus may considerably exceed that of China, Europe, and America" (*Ibid.*).

In a recent overview, the American Society of Hygiene and Tropical Medicine equally underlined the challenges to infrastructure and healthcare systems that the Ebola outbreak had already exposed back in 2014, "including the lack of adequate surveillance to assess the scope of the outbreak and inadequate systems for the prevention, diagnosis, and management of disease (Rosenthal *et al.* 2020, 1). At the same time, the paper highlighted Africa's success on a variety of innovative programs, including vaccination programs against smallpox and Ebola, vector control for malaria and other vector-borne diseases, and community programmes that encouraged the engagement between the medical community and local populations, such as effective public health policy programs for prevention and control of HIV/AIDS and tuberculosis. Rosenthal *et al.* urge the "international community" to build on this success by showing further support towards community ownership and local action, developing infrastructure and equipment, enhancing both personal hygiene and homecare, importing laboratory testing equipment and mathematical modelling for "risk" assessments and addressing the economic impact during and after the crisis (*Ibid.* 2-3).

- CMMID nCov Working Group, Abbas, Kaja, Procter, Simon, van Zandvoort, Kevin, Clark, Andrew, Funk, Sebastian, Mengistu, Tewodaj, Hogan, Dan, Dansereau, Emily, Jit, Mark, Flasche, Stefan, *et al.* "Benefit-risk analysis of health benefits of routine childhood immunisation against the excess risk of SARS-CoV-2 infections during Covid-19 pandemic in Africa." (1 May 2020). <https://cmmid.github.io/topics/covid19/EPI-suspension.html> [Accessed 3/5/2020]. Updated version published online in *Lancet Global Health* (July 17 2020). [https://doi.org/10.1016/S2214-109X\(20\)30308-9](https://doi.org/10.1016/S2214-109X(20)30308-9) [Last Accessed 24/8/2020].

¹⁷ LSHTM update on "Strategies combining self-isolation, moderate physical distancing and shielding likely most effective COVID-19 response for African countries." (21 April 2020). <https://www.lshtm.ac.uk/newsevents/news/2020/strategies-combining-self-isolation-moderate-physical-distancing-and-shielding>. [Accessed 3/5/2020].

Following the long tradition of research and intervention conducted by the LSHTM over the years in Africa, CMMID focused on the impact of the pandemic on the national immunisation programmes, a number of which are funded by the *Bill and Melinda Gates Foundation*. The Ebola crisis that lasted from 2013 to 2016 shifted all attention to vaccination and treating the epidemic, which unfortunately took attention from existing vaccination programmes resulting to a measles outbreak. Following WHO's advice to conduct risk assessments over parallel vaccination programmes during such crisis, the team conducted a benefit-risk analysis of the childhood immunisation programmes in all 54 African countries and territories. As in the previous probabilistic simulation models, the team used two scenarios, a "high impact scenario" that focused on an estimated death of children below the age of 5, over a six-month running period for the pandemic, considering all vaccinations, and a "low impact scenario" focusing only on child deaths considering measles. The researchers assumed that 60% of the population would be infected due to public transport and vaccinators. The results heavily supported the sustaining of routine childhood immunisation, as both scenarios heavily outweighed the excess death risk associated with Covid-19 (in the high impact scenario each excessive death associated with the virus equalled to the prevention of 84 deaths of children due to lacking vaccinations, while in the low impact scenario the benefit-risk ration was 3). The team concluded that "Although there will be heterogeneity in the implementation of and compliance with prevention and control measures for COVID-19 in different countries, the benefits of sustaining childhood immunisation far outweigh the risks of excess SARS-CoV-2 infections acquired during the vaccination visits, especially for the vaccinated children" (p.p. 6-7). This assessment further implied the continuous support of routine immunisation programmes across Africa and necessary strategies to deal with "logistical constraints, staff shortages, and reallocation of resources" during this, or any future pandemics.

Both papers show that the spreading of the virus is not simply the "African case", but rather, "Africa" could be a blue print for a unified exit strategy for the rest of the world. In their editorials for WHO's *Eastern Mediterranean Health Journal*, Mahjour and Alwan repeatedly warned about the unpreparedness of our world system in combating the spreading of deadly viruses, such as the previous outbreaks of the "novel coronavirus" in 2013, and Ebola in 2014. In their 2013 editorial, the authors reflected on the threat of coronaviruses as an urgent matter for our "global public health community" (2013, 3-4). They warned that, "No one knows how far the disease might spread and its ultimate ramifications for the region and also the world" (2013, 3-4). Admitting upon deficiencies to promptly deal with the Ebola crisis in 2014, the authors further highlighted shortcomings in equipment, limited resources, and "deficiencies in IHR core capacities at country level", giving yet another stark warning: "Unless and until we all come together and address our existing weaknesses and insufficiencies, any remedial measures instigated will at best be fragmented, short-lived and symptomatic and leave the same systems exposed and perhaps even more vulnerable to the next global threat/s" (2014, 656-660).

One methodologically deficiency that surfaced during the Ebola pandemic of 2014 was the problematic integration between epidemiologists and anthropologists over logistical, epistemological, and ethical differences. In a recent paper reflecting upon the experiences of anthropologists working in West Africa between 2014 and 2016, Lees *et al.* (2020) discussed a number of issues regarding the legitimacy of anthropologists, questioned by both public and health communities in addition to the long-term suspicion of sceptical medical scientists over the involvement of anthropologists in an urgent health crisis, including a number of ethical issues regarding their conduct and contact in the field, particularly in the long term. Although Lees *et al.*, highlighted the importance of the mediatory role anthropologists play as "cultural brokers" or "firefighters", the **enlargement** of the ethnographic scope within the frameworks of human rights

and global health, proved to be problematic both in terms of focus of research and collaboration in the field. According to aid workers, the speed of the outbreak did not allow anthropologists to foresee the long-term consequences of their conduct beyond the crisis, while participant observation was a convenient way of avoiding to “get their hands dirty” (*Ibid.*). Vice versa, anthropologists felt that most of the time, especially in the beginning of their fieldwork, had to advocate for their presence in the field to both researchers and the local population. Hence, they lost the focus of their research, and consequently, affected the quality of gathered data. The question of legitimacy therefore divided the collaboration raising ethical questions over biased mapping techniques and surveys delays in collecting and disseminating of responses, all of which affected “the focus on making the information decipherable of the data for front-line stuff” (*ibid.*).

The Ebola crisis exposed the epistemological gap between epidemiology and anthropology, i.e. quantitative and qualitative methods, respectively, needs to be readdressed in both practical and ethical terms of conduct and contact with colleagues and the field and within a revived global policy calling for a unified strategy and response to future pandemics.

Elsewhere, the Department of Global Health and Development in co-operation with LSHTM’s Department of Infectious Disease and Epidemiology recently issued an ethnographic report in *Lancet Global Health* (May 5 2020) on the conditions of 228 health facilities in Tanzania back in 2018, between 7 February to April 5 (Powell Jackson *et al.* 2020). The report is relevant to the current pandemic reflecting on issues of conduct and contact in outpatient settings, by focusing on hand hygiene, use of gloves, disinfection methods, and waste management. The authors concluded that health workers infection prevention and control compliance were highly “inadequate” at the time, and thus, need urgent updating by addressing issues of conduct and contact along with further developing the existing health facilities. In addition to these issues that require the engagement of local communities with world organizations from below, the active engagement of communities in health policies will further address issues that emerge under lockdown, such as the rise in domestic violence or the taking care of the vulnerable. Such urgent and sensitive private matters can only be dealt with mutual trust between government and local institutions. The DEPTH Research Group of Public Health and Policy at London School of Hygiene & Tropical Medicine. Marston, Renedo, and Miles (2020) recently repeated this call for collaborative grassroots engagement with public policy, by reflecting upon past experiences regarding the importance of community feedback for the containment the HIV/AIDS and Ebola outbreaks in terms of tracking and addressing false rumours, whilst promoting testing and counselling.

Despite these warnings from past experiences, a recent report coming out of WHO’s “Partnership and Health Systems Governance Collaborative” raised similar fieldwork issues in terms of how research-based evidence is collected and evaluated, along with issues of transparency and inclusion in governmentality in response to the current pandemic (Rajan *et al.* 2020; 5:e002655). The authors compared data coming from 24 countries on the way their respective governments dealt with outbreak (“Covid-19 Task Force”) addressing questions of bias and impartiality in decision making. In these terms, they questioned the exclusion of essential groups in combatting the crisis, health workers, civil society, and community groups, from making strategic decisions or at least participating in panels. This exclusion particularly targeted vulnerable groups, such as victims of domestic violence, single parents, or the elderly. The authors hence questioned the way these policy decisions were taken and by whom, asking for more transparent and inclusive governance.

Research in the Post-Covid-19 World Society

WHO's Director-General, Dr Tedros Adhanom Ghebreyesus, repeated the same warnings recently in his first declaration of public health emergency on a global scale on January 30 2020: "[...] the only way we will defeat this outbreak is for all countries to work together in a spirit of solidarity and cooperation. We are all in this together, and we can only stop it together" (Jan. 30). In his media briefing six weeks later, on March 16 2020, he offered practical instructions for prevention and protection by addressing all citizens of the world and raising the importance of self-responsibility, as well as addressing all the governments of the world in a spirit of co-operation.¹⁸ Prominent epidemiologists in the UK repeated this call in an open letter to the British Prime Minister, in which they urgently called for "universal weekly" testing as an exit strategy that "would entail mobilisation of community assets." (Peto *et al.* 2020, 1421).

Nevertheless, WHO's initiative for a unified response to the pandemic was undermined by a series of conflicts of interests and tensions between various actors, political institutions, national government policies, public and private agencies, causing fears and anxieties, false rumours and conspiracies, spreading online on social media like an "infodemic"¹⁹, or an "epidemiology of ideas"; or what Edmund Ng (2020) only recently called, "the pandemic of hate". This so-called "infodemiology"²⁰ builds on a general climate of paranoia and distrust that distort the field with dire consequences.

The gaps between public health interests and/as social policy became evident in India from March to May 2020, following the shutting down of construction sites and closing the market. Lacking of a backing government plan to address the return of migrant workers to their families in the countryside, or at least, to safely accommodate them during the lockdown, the consequences for hourly paid workers were dire, in their majority left homeless and exposed to the virus in overcrowded cities. The riots that followed on 30 March 2020 only underlined this gap between government policy and grounded truth in terms of the ethical issue of inclusion conceptualized as a public policy that equally addresses individual circumstances along the lines of the entire society (Samaddar 2020, 1-23). For Samaddar, the under-reported riots in Indian cities called for new "*biopolitics from below*", one that would consider the interest of all citizens and non-citizens, based on mutual trust with the government (*Ibid.*). Yet, during and after the outbreak of the pandemic, the bond of trust between world governments and citizens, i.e. the "social contract", seemed to be broken on a global scale, carrying a double consequence: on the one hand, spreading as confusion and fear, distorted and amplified in social media; and on the other, the exclusion of the underclass is the most important threat to, ironically enough, global health (Palat 2020, 24-30).

¹⁸ WHO Director-General's opening remarks at the media briefing on COVID-19 – 16 March 2020." (March 16 2020). <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---16-march-2020>. [Accessed 7/5/2020].

¹⁹ Larson, Heidi J. "Comment: A call to arms: helping family, friends and communities navigate the COVID-19 infodemic" in *Nature Reviews Immunology* 20, 449–450 (July 2 2020) <https://doi.org/10.1038/s41577-020-0380-8>; and "The biggest pandemic risk? Viral misinformation" in *Nature* 2018; 562:309. Additional article: "The pandemic of social media panic travels faster than the COVID-19 outbreak", in *Journal of Travel Medicine*, 2020, 1–2 (3 March 2020) Editorial : "misleading rumours and conspiracy theories about the origin circulated the globe paired with fearmongering, racism and mass purchase of face masks, all closely linked to the new 'infomedias' ecosystems of the 21st century marked by social media. A striking particularity of this crisis is the coincidence of virology and virality: not only did the virus itself spread very rapidly, but so did the information—and misinformation—about the outbreak and thus the panic that it created among the public."

²⁰ Hou Z, Du F, Zhou X, Jiang H, Martin S, Larson H, Lin L. "Cross-Country Comparison of Public Awareness, Rumors, and Behavioral Responses to the COVID-19 Epidemic: Infodemiology Study." *Journal of Medical Internet Research* 2020;22(8):e21143. DOI: [10.2196/21143](https://doi.org/10.2196/21143) [Last Accessed 20/8/2020].

In their recent article published in April 2020, Khanna *et al.* (2020, 703-710) further evaluated India's response to the pandemic by comparing to China, US, and Italy. Along with issues of social mobility, the authors highlighted that, at least up to this point, the global response to the pandemic seemed to be ignoring the infrastructural conditions of a locale; for example, in assessing the danger of transmission of the virus via open sewages in overcrowded areas, the danger of contaminated water in complicating recovery, or the use of air conditions in contributing to the distribution of the disease. This criticism highlights the narrowness in the scope of laboratory research to see beyond the pathogenic character of the disease. On the other hand, as past anthropological experiences in West Africa during the Ebola crisis of 2014 show, this reduction in the scope of research results to limiting the role of anthropologists to that of a "cultural broker", and/or ethnography to a simple kit or tool -rather than questioning the ways of contact and conduct in the field.

In these terms, both the IMF's Managing Director, Kristalina Georgieva, in her report issued on April 17 2020,²¹ and the UN Head of Poverty expert, Philip Alston, in his report almost a week later,²² reflected upon the long-term dramatic consequences of the pandemic for the world economy, especially for those of low living standards. Alston gave a frank assessment of the situation: "'This pandemic has exposed the bankruptcy of social support systems in many countries.' Alston said. 'While some governments have embraced far-ranging measures previously dismissed as unrealistic, most programmes have been short-term, stop-gap measures that merely buy time rather than address the immense challenges that will continue well into the future. Now is the time for deep structural reforms that will protect populations as a whole and will build resilience in the face of an uncertain future.'"

One of those international initiatives for restructuring on a global scale is WHO's "Solidarity" network, referring to a global clinical trial programme that invites patients of all backgrounds to participate in recording the results of their clinical trials of drugs, in order to establish by comparison how specific drug patterns may improve or slow down the infection.²³ Another opening up of research to a global scale came with the question of ethnicity as a potential risk factor in urban cosmopolitan settings. A recent comment in *Lancet* urgently called for further investigation on ethnicity as a factor, especially in overcrowded areas, asking "to ascertain ethnicity data, reporting patterns, associations and outcomes", which may affect intervention on a global scale (Pareek *et al.* 2020, 1421-2). A third area of global interest is poverty and inequity. In countering this, WHO provides software tools to local authorities to help addressing such long-term issues. One of the tools is the Urban HEART guideline which identifies health inequities in health systems performance, by addressing health determinants and intervening in health policy (Kumaresan *et al.* 2020, 727-32). In addition to WHO's cross-disciplinary engagement, there are also private and national institutions that provide additional tools, such as the *Global Biodefense* online portal,²⁴ or the *National Institutes*

²¹ "IMF Managing Director's Statement to the Development Committee 17 April 2020". <https://www.imf.org/en/Publications/Policy-Papers/Issues/2020/04/17/IMF-Managing-Director-s-Statement-to-the-Development-Committee-April-2020-49344> [Accessed: 18/4/2020].

²² "IMF Managing Director's Statement to the Development Committee 17 April 2020". <https://www.imf.org/en/Publications/Policy-Papers/Issues/2020/04/17/IMF-Managing-Director-s-Statement-to-the-Development-Committee-April-2020-49344> [Accessed: 18/4/2020].

²³ "Solidarity". <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/global-research-on-novel-coronavirus-2019-ncov/solidarity-clinical-trial-for-covid-19-treatments> [Accessed 7/5/2020].

²⁴ "Global Biodefense." <https://globalbiodefense.com/novel-coronavirus-covid-19-portal/> [Accessed: 20/4/2020].

of Health with online updates on the latest developments from around the world, respectively.²⁵ Such “live” networks contribute to the emergence of online, horizontal, informal networks on the moral basis of solidarity, giving much-needed agency and sense of control to those involved on a volunteer or working basis. They pave the dialogue between epidemiologists and anthropologists, aid workers and policy makers, as a kind of “*correspondence* [...] to these happenings and interventions” (Ingold 2014, 389).

There is a wind of change taking place in the world, and vice versa, as the world changes so do its practices. Back in 1995, George Marcus made the point that because of new technologies ethnography has inevitably moved on from the single sited to multi-sited “fields” (including virtual and digital environments). The Covid-19 outbreak sped up the biotechnological processes of integration and enlargement between anthropology and epidemiology unearthing the third space from which the ethnographic “field” emerges from the local to global scale (Fischer 2009, 2018). In this context, ethnography extends beyond the “*Malinowskian mise-en scene*”, through emerging formal and informal social networks, i.e. the “network society” in Castell’s hi-tech terms (1996), or “world society” in Hart’s terms, respectively, referring to “the totality of social relationships linking the inhabitants of earth” (Hart 2003). The activation of such networks during the pandemic shows that this dialectical process of enlargement and integration of the focus and scope of research from local to global scale *emerges* out of critical and uncontrolled conditions, which urgently need a re-evaluation both of the ethnographic method and the integrated relationship between social epidemiologists and medical anthropologists via the prism of digital ethnography. The latter, may be key to planning and implementing a universal strategy on a global scale, as a blueprint for non-pharmaceutical interventions for future outbreaks.

Conclusion

In sum, research on Covid-19 is *still* being formed and reformed, modelled and adjusted, cross examined and corrected, *emerging* out of conditions seemingly beyond control. As discussed above, the identification of degrees of “risk” categories, when takes place exclusively on the basis of laboratory data, contradicts the grounded realities whilst presenting various levels of conflict of interest in implementing public policy. Accordingly, any counter-response to the virus has to be followed by population feedback and further “adjustments”. They raise further questions regarding the process of adjusting itself, biased implementation and homogenization of results, and conclusions that may “overfit” a predesigned (and sometimes politically motivated) a priori target. In order to scientifically counter these external infection of the field with distorted results, time delays, and conflicts of interest, the CMMID team underlined the necessity to closely follow FACTS, referring to monitoring mortality rates on a global scale and comparing records with weekly excess death rates from around the world, starting from 2010, as part of better contextualizing the impact of SARS CoV2 in relation to previous pandemics.

The Ebola crisis of 2014 proved to be deeply divisive in the fieldwork collaboration between anthropologists and epidemiologists: first, there was a general consensus of the lack of common ground between anthropology and epidemiology. Second, there is (still) a general dominance of

²⁵ See updates and timeline of all activities relating to Covid-19 of the World Health Organization at <https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19>. And National Institutes of Health. <https://horizon.lshtm.ac.uk/portal/webclient/index.html#/desktop> and <https://www.coronavirus.gov/> [Accessed: 7/5/2020].

quantitative over qualitative analysis in terms of the scientific authority of epidemiology over the legitimacy and relativism of anthropological thought. This resulted to ethnography used as a toolkit to epidemiologists, and anthropologists being reduced, (ironically) to “informants”. In addition to this, the paper highlighted gaps and contradictions in the dialectical process of integration and enlargement, i.e. how laboratory research becomes public policy, and vice versa, how anthropologists can fill in the third ethnographic space. What is at stake is how anthropologists and epidemiologists could practically enlarge their integration via the use of digital and online means of communication, comparative multi-sited research, and networking as it emerges out of the “world system”. On the one hand, computer mathematical modelling to quantify qualitative data, and on the other, digital experiential technologies to cross examine empirical data, may prove essential in catching up with the speed of future outbreaks.

In closing this overview, I wish to refer to Michael Fischer’s (2018) final message in his book on emerging ethnographies in the world context. He takes cue from Buddhist philosophy, offering a much-needed beam of hope in this time of world health crisis and social upheaval. It is a message coming all the way from Fukushima, Japan: “The best way to overcome disaster is to accept disasters happen.” (*Ibid.*, 332-3). With a strongly ethical belief in human determination, self-awareness, and a new understanding of Humanity as it evolves through the biotechnological changes taking place inside and outside our bodies through “emergent forms of life” such as the virus, Fischer argues that, “Anthropology in the meantime will be a critical tool for responsive robustness both for when things go *wrong* and to make things go *right* more often” (2018, 327). This can only happen by means of collaboration and solidarity. It can also happen through our adaptation to new technologies which will inevitably redefine our contact and conduct in the world. This is the third space in which ethnography emerges as a mediator between grounded truths and public policies and as an active agent of change.

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